



SIERRA LEONE.

Annual Report
OF THE
Department of Agriculture
For the Year 1932.

1933.

Printed by the GOVERNMENT PRINTER, Freetown.



SIERRA LEONE.

Annual Report

OF THE

Department of Agriculture
For the Year 1932.





Digitized by the Internet Archive
in 2025

CONTENTS.

PART I—AGRICULTURAL ADMINISTRATION AND PROGRESS.

REPORTS ON—	PAGE.
ORGANIZATION 	1
GENERAL AGRICULTURAL ASSISTANCE ...	2
PROGRESS OF THE CHIEF CROPS AND PRODUCE 	3
METEOROLOGICAL MATTERS 	5
REVENUE 	5

PART II—DETAILS OF ASSISTANCE AND PROGRESS.

REPORTS ON —	
NORTHERN CIRCLE 	5
NORTH-WESTERN CIRCLE 	9
WESTERN CIRCLE 	11
EASTERN CIRCLE 	13
PRODUCE INSPECTION 	15

PART III—AGRICULTURAL INVESTIGATION.

REPORTS ON—	
ENTOMOLOGICAL WORK 	17
MYCOLOGICAL WORK 	20
NJALA AGRICULTURAL STATION 	23
NJALA OIL-PALM PLOTS 	30
NEWTON EXPERIMENTAL FRUIT FARM ...	32
MASANKI OIL-PALM PLANTATION 	35

APPENDIXES—

I—DISTRIBUTION OF PLANTING MATERIAL, 1932	36
II—RAINFALL, 1932 	39
III—REVENUE 	40
IV—OIL-PALM INVESTIGATIONS, NJALA 	41

DEPARTMENT OF AGRICULTURE.

Report for 1932.

PART I—AGRICULTURAL ADMINISTRATION AND PROGRESS.

ORGANIZATION.

The total estimated provision for the internal work of the department (that is, excluding expenditure in support of external organizations, now removed to Miscellaneous Services) was £21,402, as compared with £24,552 for 1931. During the year the policy approved by the Secretary of State, of concentrating on means for the direct agricultural advancement of the country, together with economies for increasing the efficiency of Newton Fruit Farm and the circumstance that, the planting of Masanki Oil-palm Plantation being completed, it was put on a maintenance basis, enabled the estimates of expenditure for the year 1933 to be reduced to a total of £16,096. Taking estimated expenditure on general agriculture alone we have now for £14,267, a progressive agricultural policy, as compared with the long-range plans of such a year as 1929, costing nearly twice as much, or £27,636.

The year saw no additions to the staff of the department. Concentration of the field work in adjoining areas, begun last year, is well justifying itself. The reports from agricultural officers have become most encouraging; and it is due to these officers, who base their work on a close knowledge of native social conditions, including agriculture, that farmers are now coming to show confidence in the department, and keen interest; and that improvements introduced by it are now spreading by their own momentum.

Farmers in the concentration areas must be registered and the work with them continually followed up, in order that this may be made effective and that the necessary changes of officers in charge may be carried out without breaking continuity and so losing their confidence. It is of first importance, too, that farmers should be assisted to market their farm produce: the continual attention by officers to this valuably increases that confidence. All work is based on first attention to food-crops, especially rice; and with the present agricultural policy it is not likely that Sierra Leone will follow the mistake of other countries that are now suffering because export crops have been considered to be of first importance.

The substitution of practically trained instructors for the old agricultural assistants, academically informed and remote in interest and often language from the people, is already a matter of thankful regard by the agricultural officers, who are in a better position than anyone else to judge of the usefulness of the change.

The Agricultural Department is not now a clerical department with an agricultural bias. A most encouraging feature of it is the keen co-operation that now exists among all its members. Officers work and correspond together directly: there are no longer any "Divisions"; and while the Entomologist and Mycologist do their particular work in close consultation, all officers are in direct touch with them, as well as with the Produce Inspection Branch, for a closely defined co-operation. The old idea of Head Office as an ex-cathedral institution or as a clearing house or post office for the rest of the department has gone. Head Office sets forth policy and procedure plainly, gives technical information, is kept automatically informed of what is passing between the different parts of the organization, and sympathetically urges and guides individual and combined effort. There is a feeling of progress and success in the department, which is chiefly due to the fact that the Director has never worked with a better and keener set of colleagues.

GENERAL AGRICULTURAL ASSISTANCE.

The supplies and exchanges of planting material with other countries, described in the last report, have extended; but further co-operation is still invited from tropical and sub-tropical countries, assistance for which is afforded by the lists given in Appendix IV of the Report for 1930.

The useful work of the Produce Inspection Branch of the department has been maintained: to descant upon it would be merely to repeat what was said in this connection in the last report. It need only be added that firms show an increasing appreciation of the protection that is being afforded by Government to the produce of the country, letters from London offices having given generous expression of this.

One leaflet, entitled "How to Grow Cacao and be Able to Sell it," was added to the series. The employment of the local Press in giving information and conducting propaganda was continued, the number of articles published being 58, of which 30 were on general agriculture and 13 and 15 respectively gave produce inspection and crop reports. The assistance of the Editors in this useful publicity continues to be appreciated.

The close co-operation between the Education and Agricultural Departments, based chiefly on the school garden, continued and extended. The first of what was hoped to be a series of Student Teachers' Courses in Agriculture, the Principles of Teaching, and

Sanitation, was held by the two departments at Njala in August, the lecturers being Messrs. P. J. Moss (who managed the Course for the Director of Agriculture), R. R. Glanville, E. Hargreaves and E. I. Nisbett for agriculture, and Messrs. F. A. Lacey and G. V. Herd of the Education and Health Departments, respectively, for the two last-mentioned subjects. In reporting on the results of the Course the lecturers stated: "It is pleasant to record that the class as a whole worked hard and willingly, and lecturers received ample evidence of earnest effort to acquire information. This applies even (perhaps particularly) to those students who failed to reach the required standard. Twenty-one students out of twenty-eight attending the Course satisfied lecturers, and were granted certificates. No attempt was made to grade successful students, as the object of these courses is mass improvement." The important point is that the work stimulated by the courses is regarded as continuous, so that the approach of Agricultural Officers to teachers has been facilitated and activity in school gardens quickly extended and improved. In addition the teachers have spontaneously formed a scheme by which they keep in touch with one another, exchanging information, advice and planting material. The promise of this first course is most encouraging; and continuation of the scheme is necessary for the departments concerned to be efficiently doing their work.

With a special view to assisting the Colony proper, the work for giving farmers the advantages of credit co-operation, foreshadowed in the last Report, was continued by the drafting of legislation for controlling and regulating mutual credit co-operation, an Ordinance and Regulations being submitted to Government which received favourable support by the Horace Plunkett Foundation.

With the same object, having in view the interests of the Colony Peninsula, the Director spent part of his leave in gaining the interest of a London firm in the export of oranges from the Colony. As a result, trial shipments of these oranges on commercial lines, with the aid of this firm, showed that they are readily acceptable in the English market as regards taste and consistency, being similar to Brazilian oranges; but that they must be coloured yellow in order to enter freely into that market. All available information on the ways of doing this is being collected by the Director; and the department, or preferably others with its assistance, ought to be able to give the Colony oranges a lucrative opportunity of export sale next season.

PROGRESS OF THE CHIEF CROPS AND PRODUCE.

This is summarized largely from reports furnished by the Agricultural Officers and the Assistant Inspector of Plants and Produce.

In spite of low and fluctuating prices, palm kernels attained a record export of 77,162 tons: in similar circumstances palm oil shipments also increased over those of the previous year. The steadiest market was shown by piassava, the quality of which continues to improve under practical instruction by the department: a circumstance recognized appreciatively by importers in England and the United States. It was a good season for ginger, but prices were low: as shown in the Western Circle report, the annual exports of this do not indicate the yearly production.

Rice and all other food-crops were plentiful: there was a greater planting of cassava in some areas through fear of locusts. The season was favourable too for plantation crops, including coffee and cacao: assisting usefully the increased interest that is being specially taken in the former of these.

Agricultural exports are shown in order of their value in the following table, in which comparison is also made with the exports in pre-war and war-boom years:—

TONS.

—		1913.	1923.	1931.	1932.
Palm kernels	...	49,201	59,545	54,462	77,162
Kola	...	1,865	2,545	1,584	2,085
Palm oil	...	2,571	3,346	1,359	2,208
Piassava	...	839	1,620	3,150	2,877
Ginger	...	2,047	1,395	1,927	1,382
Rice	...	798	9	177	554
Peppers	...	9	147	13	67
Cacao	...	2	29	61	81
Hides and skins	...	9,789*	10	31	27
Beniseed	...	36	—	83	120
Raffia	...	—	—	$\frac{1}{2}$	6
Coffee	...	8	4	7	$2\frac{1}{2}$

*Leaves.

POUNDS STERLING.

—		1913.	1923.	1931.	1932.
Palm kernels	...	920,943	968,797	449,742	687,477
Kola	...	328,003	187,476	47,847	41,373
Palm oil	...	56,659	102,645	19,830	26,914
Piassava	...	12,280	20,035	31,846	23,290
Ginger	...	35,468	46,236	32,518	22,877
Rice	...	3,991	206	1,596	4,054
Peppers	...	565	11,818	552	2,162
Cacao	...	52	1,004	1,034	1,295
Hides and skins	...	4,249	723	1,689	1,219
Beniseed	...	460	—	752	1,122
Raffia	...	—	—	22	132
Coffee	...	598	186	237	65

Excluding palm kernels with their increase of 22,700 tons from the previous year to the record, the rest of the above products also increased, as regards their total, from 8,393 to 9,410 tons in spite of the continued low prices.

METEOROLOGICAL MATTERS.

The plan of meteorological recording mainly by schools under inspection and guidance by Agricultural Officers is justifying itself. The records of rainfall are shown in Appendix II.

REVENUE.

The details of this are given in Appendix III.

A. H. KIRBY,
Director.

PART II—DETAILS OF ASSISTANCE AND PROGRESS.

NORTHERN CIRCLE.

Until the separation of the Northern and North-western Circles in November, Mr. R. R. Glanville was in charge, when he handed over to the writer.

The policy of concentrated effort was continued and is proving very satisfactory. As opportunity occurred, keen farmers outside concentration areas were rendered all possible assistance. An important part of the Agricultural Officer's work was the training of Instructors. This change in subordinate staff is economical and satisfactory, but more Instructors could have been employed with advantage.

Fortunately, locusts did not interfere with routine duties during the year. The Agricultural Officer's only absence from the Circles was due to his giving assistance at the Teachers' Course at Njala.

The work done at MAKUMP SUB-STATION is summarized as follows. The CACAO did well and has benefited by the sanitary treatment received last year. 459 pods were distributed, and 1,000 were fermented. The ROBUSTA COFFEE continues to thrive only moderately. Occasional trees are good, and will serve as a source of seed in the coming season. A second small plantation was established during the year. The KOLA growing under shade is good: that grown without shade makes slow progress, but is

now well-established. The NIGERIAN OIL-PALMS continued to do excellently, and are ideal for demonstration purposes. The trees are now six years old, and are, at the time of writing, bearing a heavy crop. From 56 trees, 578 heads were harvested, the average weight of a head being 3 lb.: this compares with 135 heads harvested in 1931. The COCONUTS continue to progress satisfactorily. The SISAL was maintained. Six varieties of BANANA were grown with success.

Yellow and Chinese YAMS have proved very popular, particularly the former; the Chinese variety is now fairly common. The system of lending "seed" was much appreciated, and is a simple and effective way of increasing the department's resources for distribution: twenty-two farmers near Makump were supplied in this way. Altogether, 1,586 lb. of yellow and 1,071 lb. of Chinese yams were grown and distributed. Small quantities of five additional varieties were grown. All common varieties of CASSAVA were grown on a small scale. The demand for the mayugbe variety is not yet satisfied, except in the immediate neighbourhood.

OTHER CROPS grown for demonstration purposes, test of suitability and multiplication of seed, were: Plate maize, sunn hemp, sweet potato (5 varieties), guinea-corn, ginger, coco-yam, fundi (3 varieties), ragi (4 varieties), *Setaria italica*, *Panicum miliare*, beans (8 varieties), beniseed, ground-nuts (3 varieties), pineapple, coconut and breadfruit. IRRIGATION was extended during the year, and, in addition to being used to demonstrate this method for growing food-crops during the dry season, was successfully used for multiplying 10 Indian and 6 promising native varieties of swamp rice. Observations on these rices were as follows:—

Indian and Ceylon Rices.

Variety.				Duration in days.	Average Number of Tillers.	Height, feet.	Yield per Acre, lb.
Baitel Fakir	...	...	...	182	4	6	3,539
G. E. B. 24	...	...	...	163	6	4 $\frac{1}{4}$	3,298
Vallai Illankalyan	...	...	...	157	4	4 $\frac{1}{4}$	3,265
C. O. 7	...	...	...	175	6	5	3,122
Panianala	...	...	...	187	4	5 $\frac{1}{2}$	3,008
C. O. 5	...	...	...	187	4	5	1,598
Kar	...	...	...	138	5	5	1,572
Jeeraga Samba	...	...	...	160	6	5 $\frac{1}{4}$	1,502
A. D. T. 1	...	...	...	198	6	4 $\frac{3}{4}$	1,445
A. D. T. 3	...	...	...	123	3	3	378

Native Rices.

Variety.				Duration in days.	Average Number of Tillers.	Height, feet.	Yield per Acre, lb.
D. C.	...	...	...	162	4	5	2,888
Bai Salay	...	...	...	182	4	5 $\frac{1}{4}$	2,550
Litoma	...	...	...	178	3	4 $\frac{1}{2}$	2,306
Bathurst	...	...	...	168	3	4 $\frac{3}{4}$	1,752
Wo	...	...	...	197	5	4 $\frac{1}{2}$	1,512
Bis	...	...	...	197	3	4 $\frac{3}{4}$	1,176

The NURSERY WORK was maintained but on a reduced scale. Several thousand excellent Nigerian oil-palm seedlings are available for distribution next year. For distribution of planting material see Appendix I. The chief PRODUCE HARVESTED from the farm was cacao 1,495 pods, yellow, Chinese and Nigerian yams, 1,914, 2,472, and 538 lb.; coco-yam, 1,647 lb.; sweet potato, 1,159 lb.; oil-palm, 794 heads; plantain, 52 bunches.

KABALA SUB-STATION has been successfully maintained as a centre for demonstration and seed supply. The site is good and attracts much attention. The following crops were grown: coffee; Nigerian oil-palm; Chinese, yellow and wakruneh yams; coco-yam; guinea-corn; ragi; mayugbe cassava, sunn hemp; ground-nuts; maize; *Setaria italica*; *Panicum miliare*; Canary banana; three Indian varieties of swamp rice.

At BATKANU SUB-STATION, similar crops were grown. The surrounding neighbourhood has clearly benefited from the presence of the farm. WET-LAND RICE cultivation was again fostered in every way possible. D.C. seed rice was distributed on loan, the recipients being expected to return an equal amount *plus* one-tenth. In Koinadugu District, 13 bushels were loaned to 10 farmers; in Bombali, 9 bushels to 8 farmers; in Karene, 20 bushels to 20 farmers. Unfortunately the germination was poor, and many of the recipients have been allowed to retain all their harvest, and will return the amount due next year. There is still a very large demand for seed of this variety, and requests for instruction in the transplanting method are frequently received. The increase in mining activities disturbed production and consumption in some areas, but there was no shortage of rice at any time during the year. Planting material of other FOOD-CROPS was again widely distributed. This form of assistance, besides being the most appreciated, is also one of the most satisfactory from the Agricultural Officer's point of view: results are immediate and very definitely beneficial.

Despite a not very encouraging price, CACAO is a popular crop in southern Bombali. Seed is now available from native-owned plantations, and it is encouraging to find farmers planting for themselves and using the improved methods taught them by the department. In south Bombali there are now 111 plantations established under direct supervision and many others made independently. In this area, 42 nurseries were made under supervision during the year. COFFEE is a comparatively new crop, but there is already a very keen demand for seed. The few established plantations promise well. 78 nurseries were made during the year, 71 of these being in Bombali. In some nurseries distant from Makump, germination was poor through delayed sowing. Elsewhere results were good. The distribution of NIGERIAN OIL-PALM was continued: 20 plantations were established and 13 nurseries made. It is difficult to get farmers to take the necessary precautions against fire and animals: they only appreciate the necessity after the damage has been done. PLOUGHING was hindered during the year by the presence of locusts at the time when it normally starts. The farmers believed that if the invasion was again serious, the ploughed areas would be the first to suffer. However, 9 farmers ploughed, and at Karina it is now well established on upland, and for the first time, wet-lands were ploughed successfully.

In December, an attempt was made to foster RAFFIA production for export. The three Kuniki chiefdoms only were concentrated on. Potential buyers were difficult to obtain, and until a market was assured, the campaign was held in abeyance. Results are not yet available.

It is difficult to obtain information about the CATTLE population. Prices fell steadily throughout the year, and many more cattle than usual were taken into Mende country in the hope of getting better prices. The recent enforcing of the export duty on kola, amounting to over 30 per cent. *ad valorem*, where natives deal direct across the border, is very unpopular, and will adversely affect the cattle trade with French Guinea.

Schools were given advice on the laying out of SCHOOL GARDENS and methods of cultivation, and were supplied with vegetable seeds and planting material of various food-crops and ornamentals.

The total number of farmers recorded in the FARMER'S REGISTER, who own plantations or nurseries made under supervision, and receive regular assistance, is 238; the records show that these farmers had been helped to make 136 plantations of cacao, 57 of Nigerian oil-palm and 24 of coffee, besides 44, 13 and 78 nurseries of these, respectively, in 1932. An additional 71 farmers are entered as having received assistance during the year.

G. M. RODDAN,
Agricultural Officer

NORTH-WESTERN CIRCLE.

In previous years and until November, 1932, this Circle, which comprises the Port Loko and Kambia Districts, was in charge of the Agricultural Officer, Northern Circle. For convenience the two Circles were administered as a single unit. In November, Mr. G. M. Roddan took over the Northern Circle from Mr. R. R. Glanville, the substantive officer, who was then left free to concentrate on the North-western Circle (Scarcies Region) where headquarters have now been established at Kambia.

On account of their distance from Makump, where the Agricultural Officer was stationed when he had charge of both Circles, the Kambia and Port Loko Districts have perforce received less attention than was desirable. Now that an officer is actually stationed in the Circle considerably greater progress is anticipated, especially as the farmers are anxious to obtain better planting material and to learn more remunerative cultural methods. As the Circle includes the very important rice-producing areas of the Scarcies Rivers and the Port Loko Creek the value of having an Agricultural Officer in constant touch with the farmers is very great.

The PORT LOKO SUB-STATION has been maintained. The nursery was well stocked with coffee, Nigerian oil-palm, coconut and miscellaneous fruit trees which will be distributed in 1933. In the demonstration section yellow yam, Chinese yam, mayugbe cassava, Aku corn and other crops were grown for the dual purpose of raising planting material for distribution to farmers, and of demonstrating correct cultural methods. The MELEKURI SUB-STATION was also maintained on similar lines.

DISTRICT WORK continued to be the most important branch of the Agricultural Officer's work, and in this he was assisted by a subordinate staff of one Overseer and two Instructors, all of whom were stationed in the Port Loko District. The main object of district work is to afford practical assistance and instruction to the farmer on his own land: he is taught to select and use the best planting material obtainable; and improved cultural methods are demonstrated and explained to him. It is encouraging to be able to record that as a result of this propaganda and teaching, many farmers, without aid, can and do practise these improved methods which include the making and care of nurseries of coffee, oil-palm, fruit trees and other perennials; planting them on the farm in well-prepared, properly spaced holes; the use of protective mulches in the dry season: in the case of yams, proper trenching, manuring, planting and staking.

A list of PLANTING MATERIAL DISTRIBUTED will be found in Appendix I. In most cases the quantity was fixed not by the demand but by the limited supply. It is hoped to overcome this difficulty by establishing more sub-stations and by making it a condition that all recipients of planting material of annual crops are required to return the quantity received *plus* one-tenth: this

method is now being given a trial in connexion with the Canary banana suckers distributed in 1932; and in 1933 it is hoped to include yams, mayugbe cassava and rices in the scheme.

Farmers are exhibiting a definite interest in COFFEE which is a new crop in this Circle: 58 nurseries were made, and of these 51 were successful, and will provide seedlings for the plantations which are to be made in 1933.

There has been a demand for assistance in making NIGERIAN OIL-PALM plantations: 8 new nurseries and 9 plantations were established.

The number of COCONUT plots is rapidly increasing, especially in the towns bordering the rivers and creeks: 10 farmers received assistance in making plantations, and others in nursery management.

There is a very keen demand for CANARY BANANA suckers: 624 were supplied to 19 farmers in widely scattered towns, which will, it is hoped, act as centres for ultimate diffusion throughout the Circle.

With the co-operation of 19 rice farmers on the Port Loko Creek and Scarries Rivers, preliminary trials were carried out with the most promising of the WET-LAND RICES, including those for cultivation in deeply-flooded and saline lands, obtained by Mr. Glanville when he visited India in 1931. The final results will not be known until early in 1933; some of the varieties, especially those for deeply-flooded areas, are distinctly promising.

In addition to the planting material listed in Appendix I, small quantities of seed of various VEGETABLES and of MAIZE (Lagos White and Aku varieties) were distributed and much appreciated. SNAKE GOURD was introduced into the Circle and was successfully grown by several persons.

CASSAVA MOSAIC was found to be widespread in Kafu Bulom and in the coastal districts of the Koya and Loko Masama chiefdoms. The nature of the disease was explained in all villages in the affected region and measures for extirpating it were demonstrated. It is hoped to keep the disease in check by inducing the farmers to carry out systematic roguing and to use only cuttings from healthy, resistant plant; where the disease is very bad it may be necessary to establish farms to provide supplies of healthy sticks.

Towards the end of the year the compilation of DISTRICT AGRICULTURAL NOTES was begun.

Thirty-five HERBARIUM SPECIMENS were collected and prepared for the departmental Herbarium, duplicates being supplied to Kew.

Fifteen PHOTOGRAPHS of agricultural interest were sent to the Imperial Institute.

R. R. GLANVILLE,
Agricultural Officer

WESTERN CIRCLE.

Mr. P. J. Moss, Agricultural Officer, was in charge of the Circle throughout the year. He was also in charge of the Eastern Circle from May to October, and of the Colony (as regards applications for seed and advice on farming) from January to October.

GENERAL FARMING CONDITIONS during the year under review were favourable for plantation-crops and root-crops, extremely unfavourable for upland rice, and rather below normal for wet-land rice. The number of farmers added to the register for assistance with all crops was 253, the work for these with plantation crops being shown below.

In regard to RICE, a serious situation arose owing to abnormally early rain which prevented proper burning of upland farms. This was to some extent rectified by the hard work done by farmers in clearing by hand, but the yield and area were significantly below the normal of the last two or three years; in addition the situation was improved by the planting of larger quantities of root-crops (cassava and sweet potatoes). The department's direct effort to help was to arrange the supply of 300 bushels of wet-land rice seed to farmers in the Moyamba District (in collaboration with the Political Staff and the Agricultural Officer, Njala Agricultural Station), and help in regard to thirty-six wet-land rice farms in the Sumbuya area of the Bo District. A further extension of a deep-water rice (introduced by the department) took place on the estuaries of the river leading to Bonthe. This is a most significant development, fostered by the department, that will in time render Bonthe independent of the Scarcies for its food supply.

The striking feature as regards CASSAVA has been the strong demand for the two-cent variety introduced in 1931. It is impossible to satisfy more than a fraction of the demand, so wide is it. Small quantities are however now grown in most of the chiefdoms of the Moyamba District, so that local supplies will shortly be available, thus following the departmental policy that farmers should be enabled to help themselves. The demand for this new variety has been used in fighting the cassava mosaic disease, for not only is the variety itself less susceptible, but also recipients have been required to destroy diseased plants of other varieties. Control of this disease however makes very slow progress because there is such an enormous reservoir of infection; so large that roguing (the destruction of diseased plants) becomes impossible. One is being forced to the conclusion that real progress must wait upon the time when chiefdoms can undertake the establishment of public sources of disease-free planting material.

Work in connection with the evolution of new strains of cassava by means of reproduction by seed was continued, with the assistance of the Agricultural Officer, Njala Agricultural Station.

Of the fifteen seedlings noted in the Report for 1931 (page 6), five were selected on the basis of yield and taste. Comparison of these is being carried out, and in the case of the three best, arrangements have been made for the production of selfed seed, thus carrying the sorting of characters a step further.

Other work on annual crops in the Western Circle has been the distribution of CHINESE YAMS and varieties of COWPEA. The former has now been grown in all the chiefdoms of the Moyamba District, and in some chiefdoms of the Bo and Bonthe Districts. They have been appreciated, and will be grown more extensively in 1933. As regards cowpeas, there has been need for a short-season variety; hitherto the typical peasant has only grown kinds taking nine months. Accordingly small quantities of the Black-eye variety, widely grown in the Colony, were distributed in five chiefdoms, together with smaller quantities of an even quicker variety (Bird's-eye, from the West Indies). These varieties have been taken up enthusiastically and nearly all the harvest has been saved for seed. An indication of the value of such work by the department is found in the fact that the Black-eye cowpea has been grown in the Colony for many years, but it had not spread significantly until taken up by the department.

GINGER had a good year, but unfortunately prices fell to 1d. a lb. at the end of the year. The quantity harvested always depends solely on the price, and in the absence of a rise, less than usual will be sold. A striking feature was the comparative absence of scale-insect attack; this is believed to be correlated with weather conditions during the preceding dry season. It is doubted whether the ginger remaining in the ground ever stopped active growth. As regards production, the total quantity raised during the year was 34,500 cwt. (26,880 in the first three months) and exported 27,488, leaving stocks at 7,012 cwt.

PLANTATION CROPS had a good year, especially COFFEE. This was due to better cultivation (owners having realized that money is to be made), partly to the absence of drought. The crop as a result was earlier than usual, and harvesting began in November. At the end of the year, preparation for market was in full swing; while the price offered (4d. a lb.) caused considerable enthusiasm. Interest having been aroused, the way is now clear for teaching the better methods of cultivation. A total of seventy-six nurseries were laid out with the help of Agricultural Instructors, nearly all of which show satisfactory results. In the year under review, the nurseries belonged to towns, and seedlings will be distributed to resident farmers; in future this will be unnecessary, and only "private" nurseries will be considered. The purpose of the "town" nurseries was to ensure a supply of seedlings when the demand came; this has been achieved. A total of 170 lb. of coffee seed was sown through Agricultural Instructors.

The distribution of NIGERIAN OIL-PALMS amounted to 10,000 seedlings. In order to save expense, the method adopted was to supply 1,000 to any chiefdom which could show ten men wanting 100 each.

A West Indian farmer at Levuma has in recent years planted some acres with CANARY BANANAS, and late in 1931 he shipped a quantity to Hamburg. The result gave an indication that an intelligent, hardworking man may find export of bananas to this market profitable, provided that he limits the area under cultivation, and that constant attention is paid to the maintenance of the weight per bunch. Bunches should average at least 35 lb. for Hamburg, and no bunch should weigh less than 30 lb. on shipment; it is proved that these will be profitable—and they would apparently be unsaleable in England.

Work in respect to AGRICULTURAL TEACHING at the Mabang Academy was continued. A most important feature of the year was the holding of a COURSE OF INSTRUCTION for Protectorate teachers at Njala in August, which course was managed by the reporting officer. It is satisfactory to record that greater orderliness and interest in both garden and classroom work is shown by schools which sent teachers to the Course. For the sake of Agricultural Officers at least, it is hoped that such courses will be held annually.

It should be recorded that in November the Circle Headquarters were transferred experimentally to Mabang. The Agricultural Officer is able there to give assistance at the Oil-palm Plantation, Masanki, without in the least hindering his Circle duties.

Finally, it must be noted that the year under review was the first in which Agricultural Instructors were employed. The system has worked well; and the increase in interest among farmers is in great part due to the present character of the subordinate staff of the department.

P. J. MOSS,
Agricultural Officer.

EASTERN CIRCLE.

In the absence of the substantive officer, Mr. J. W. D. Fisher, on administrative duty at headquarters and afterwards on leave, the work was in charge, until May, of the Assistant Director, Dr. F. J. Martin, and from then until the beginning of November the Agricultural Officer, Western Circle, Mr. P. J. Moss, was in charge (in addition to his other duties shown under Western Circle).

DISTRICT WORK was necessarily restricted under its provision, nevertheless satisfactory progress was made in the easily accessible area lying astride the railway—a belt through the middle of the Circle. SUB-STATIONS to serve this area were constituted at Kenema, Pendembu and Kailahun, and six Instructors worked from these centres. The work in these may be summarized as follows: At Kenema and Pendembu, nurseries of coffee and Nigerian oil palms and small plots of Chinese yams, mayugbe and two-cent cassava were raised. A demonstration of wet-land rice-growing in little valleys with controlled water was carried out at each sub-station; but was abandoned owing to the lack of need for it and its poor results.

The important work for encouraging farmers to produce more and better FOOD-CROPS has received close attention and will be assisted by the substitution of sub-stations to give more direct effect to it. Details of the planting material distributed are to be found in Appendix I.

The growing of wet-land RICE has made rapid strides in the Eastern Circle, particularly in the easterly part; and the aim has been to encourage it in areas where it is backward, D.C. rice being the variety mainly distributed. Crops of both upland and wet-land rice were plentiful in all districts.

The demand for planting material of the quick-growing, resistant varieties of CASSAVA has been sustained. Mayugbe is now fairly well distributed throughout the Circle and two-cent is gaining in popularity. Both have been used for interplanting with ginger where this crop has been introduced to new areas. The increasing popularity of YAMS as a food-crop is noticeable and large numbers of applicants came forward for seed of the Chinese or potato variety.

With respect to the LEGUMINOUS food-crops, particular attention has been paid to cowpeas which are grown to a small extent in the Kenema and Kailahun Districts. Two quick-growing kinds were introduced: the Blackeye bean from the Colony Peninsula, and a variety Birds-eye closely resembling it from the West Indies.

Considerable progress has been made with PLANTATION-CROPS. COFFEE nurseries were made for 218 farmers and a few plantations were laid out, bringing the total of the registered plantations to twenty-nine. A number of these plantations are now yielding satisfactory crops. The nurseries have not been altogether successful, the trouble being due mainly to the lack of experience of Instructors in siting them and in keeping the owners alert in tending them. A useful planting programme for 1933 is however assured.

As in recent years, CACAO received little attention except for the usual effort to encourage farmers to ferment their produce. The quality of the cacao bought in the railway centres is inferior.

to that from the southern areas. The demand for NIGERIAN OIL-PALM continues. 3,600 seedlings were distributed, and seed was sown in twenty-one nurseries.

Progress has been made with the introduction of GINGER into cultivation near the railway in the Kenema and Kailahun Districts, seed having been supplied to forty-five farmers and planted in each case under guidance. It has been mentioned that cassava is planted in the ginger crop with beneficial results from the shade it affords. The low price on offer in the main producing centres at the end of the year is discouraging.

Whenever possible visits were paid to the schools in the Circle. Teachers and pupils show a good deal of keenness in their SCHOOL-GARDEN work; but it is generally unmethodical, and arrangements have been made in some of the schools to get this on to a sound basis: much assistance in this being afforded by the Teachers' Courses at Njala.

METEOROLOGICAL STATIONS are maintained at Circle Headquarters and at four schools in the Circle. The work of recording and care of the instruments was attended to satisfactorily during the year.

Sixty-six HERBARIUM SPECIMENS, prepared by the writer, were sent to Njala for the department Herbarium with duplicates to Kew.

The names of 329 farmers now appear in the FARMERS' REGISTER of the Circle, for both food and plantation-crops, the largest numbers being recorded for coffee, rice and ginger.

J. W. D. FISHER,
Agricultural Officer.

PRODUCE INSPECTION.

During June Mr. G. Tuach, Inspector of Plants and Produce, was transferred to the Police Department, and work was carried on by the Assistant Inspector.

In spite of the varying prices paid for PALM KERNELS, the high standard of preparation was maintained. Special vigilance was as usual necessary during the rainy season in order to check the tendency to bag the produce before thorough drying had been completed. Through offering advice and instruction to native collectors when opportunities occur, dealings in mouldy and adulterated kernels have practically ceased, and the only form of impurity detected now consists of adhering shell. As a general average the percentage of impurity, based upon the method of examination prescribed under the Native Produce Ordinance, is $2\frac{1}{2}$.

Exports reached the highest figures yet recorded, amounting to 77,162 tons; of this 41,960 tons were handled by the Railway, the remainder representing that conveyed by river and other transport. Native collectors near the ports of Sulima and Mano Salija increased their production, the total shipments from these amounting jointly to 380 tons as against 80 in the previous year.

An increase in exports of PALM OIL amounting to 849 tons indicates that a reasonably proportionate demand fell to the share of Sierra Leone. The oil offered was clean; and no cases of adulteration were either reported, or detected by the Inspectional Staff.

In contrast with that for other Sierra Leone products the demand for PIASSAVA continued at comparatively steady prices throughout the year, and at no time in any part of the country was supply in excess of requirements. The quality prepared by natives has shown considerable improvement, due to more careful methods employed in selection of palm-stalks and following instructions, forming part of the propaganda of the department, in respect of a definite period of retting, and also to the rigid enforcement of the relative section of the Native Produce Ordinance in most of the areas.

Exports amounted to 2,877 tons, a decrease of 273; stocks in hand at the end of the year showed however that this decrease must not be considered to imply falling-off in either production or general dealings.

It is of interest to record that the improvement in quality of piassava now exported has been recognized by dealers abroad, a circumstance that is emphasized by the receipt of appreciative letters by the department regarding the matter.

In an effort to improve further the quality of Piassava and to introduce its production into new areas, active propaganda was continued, including practical instruction to native producers and dealers. Two Instructors have been employed, one for the Sulima market and the other near the main railway line, where preparation has not hitherto been attempted. In the latter case progress has been slow and only small quantities have been offered so far for sale, but very keen interest has been shown by both producers and dealers. As the result of propaganda in the Sulima areas, preparation has considerably improved; samples of excellent quality have been sent to the Imperial Institute for report, and also distributed among exporters with the view of informing buyers abroad of the possibilities of creating a Prime Standard of quality, separate from that usually associated with the Sulima grade.

At the beginning of the year very little interest was shown by exporters in RAFFIA, but propaganda and teaching for production during the dry season caused more attention to be given to this fibre. Two Instructors were employed in demonstrating to native producers correct preparation to comply with export requirements.

The export of GINGER amounted to 1,382 tons, a decrease of 545 tons (as shown elsewhere), due mainly to accumulation of stocks in Freetown. The work with this commodity continues to be for improvement and the extension of its production in the railway areas of the Eastern districts.

The number of persons reported for infringements of the Native Produce Ordinance was 117; of these 109 were convicted and 5 discharged, 3 remaining to be dealt with.

The VERIFICATION OF WEIGHTS AND MEASURES was carried out by the Inspector and Assistant Inspector, and 89 certificates of justness were issued.

F. W. B. ALLINSON,
Assistant Inspector of Plants and Prod

PART III—AGRICULTURAL INVESTIGATION.

ENTOMOLOGICAL WORK.

The following account of the work is first given under the different crops with which it was done.

Although work with CASSAVA is being continued, there is nothing further to be reported for the time being.

The chief pest of CITRUS continues to be fruit-piercing Lepidoptera, 32 out of 40 species found being on this. The most important were *Achæa catocaloides*, Guen., and *Othreis fullonica*, L.

Regarding larval hosts, that of the former species has been found to be *Phyllanthus discoides* (*Euphorbiaceæ*), a common tree or shrub, and marked preference for oviposition is shown for plants which have been cut during the preceding two or three years (indicating in an important way that farming near citrus plantations may be inimical to them). In December, 1930, two larvæ were found on *Alchornia cordifolia*, and as *Phyllanthus* commences to drop its leaves at the beginning of that month, it was thought possible that the occurrence of larvæ on the other host may be connected with this, the normal food being absent. However, it is only in the case of larger trees which have not been recently cut that this fall occurs, and it is complete by the end of December, but there is plenty of foliage available on other trees. *Othreis divitiosa*, Wlk. was bred from a larva on an unidentified climbing plant, probably of the family *Menispermaceæ*; another citrus fruit-piercer, *Anomis pyrocausta*, Hmps., breeds on the flowers of *Triumfetta cordifolia* (*Tiliaceæ*), while *Euphædra* (?) *ceres*, F., (a Nymphalid fruit-piercer), was bred from *Sorindeia* sp. (*Anacardiaceæ*).

Achæa catocaloides generally appears at the end of March, and all specimens are much battered as if they had travelled far. At this time there is no suitable citrus fruit available, and they feed on cashew; these fruits are soon finished and the moths transfer to mango, then towards the end of April attention is divided between this and citrus fruit which is now becoming attractive. Very few moths are to be seen by the end of May, and they presumably migrate since they were to be found in numbers over sixty miles to the north of Njala on the 17th June. Incidentally, many other species of fruit-piercing Noctuids were observed by the Agricultural Officer (Mr. Glanville) over 100 miles north of Njala at the beginning of July.

With regard to the life-history of *A. catocaloides*, the immigrant moths laid eggs early in April, and adults emerged early in May; these soon oviposited and the next generation emerged at the end of the month, then migrated. Lengths of the stages are: egg 2, larva 18, pupa 8 days, and the pre-ovipositional period 4 to 5 days; a complete generation therefore only requires 32 to 33 days.

For enquiring into control, petrol tins containing poisoned bait were put out early in April and remained until early in July. Sodium arsenate, sodium arsenite, lead arsenate, sodium fluoride and sodium fluosilicate were used, in combination with honey, white sugar or brown sugar; additions of wine or cut citrus or mango fruit did not appear to increase efficiency. The biggest catch was made by the sodium arsenite-brown sugar mixture, and since periodical stirring is not necessary as with lead arsenate, that is the bait to be used for the present. The moths taken were mainly *A. catocaloides*, and practically all were caught between April 28 and June 2nd; thirty-nine was the largest number taken in one tin during one night. Practically no *Othreis* were taken, but it is possible that being larger insects and strong fliers they are able to leave the bait after feeding, and this is being investigated.

One specimen each of *A. catocaloides* and *Othreis fullonica* (both males) were caught during November, and bait was put out at the beginning of December, but only one *Heliophisma* sp. and three *Achæa mormoides*, Wlk., were caught during the month. Piercing moths were only to be observed in December on sweet lime, when this fruit was approaching maturity.

Pierced fruit usually falls after a varying period, and piercing by means of a pin of the required thickness was carried out in order to gain some idea of this: orange and grapefruit were used and the period until fall varied from seven days to over five months, this being apparently dependent upon the degree of maturity of the fruit. It was found that fungi of various kinds enter at the point of damage, and these account for the fall, the rate of growth of the fungus (and consequent period before fall) depending upon conditions inside the fruit relative to requirements of the fungus concerned. These are being investigated by the Mycologist.

Observations kept on COFFEE pests did not show any increase of these.

GROUND-NUT mosaic was found to be transmitted by *Aphis laburni* at all times of the year in both the field and insectary, the aphid being present in varying numbers during the whole period. During January, many were killed by a fungus (*Empusa fresenii*, Nowak).

It would appear that the symptoms are due to two, possibly three, viruses; they are relatively: (1) marked chlorosis with leaf-curl; (2) little chlorosis, no leaf-curl, and later leaves of a general darker green than normal; (3) marked chlorosis except for the leaf veins, with little or no leaf-curl. In the case of (1), the period required for appearance of symptoms after the feeding of an infected aphid was 4 to 7 days, while for (2) it was 12 to 14 days; in (1), 4 to 5 leaves are formed before the previous leaf assumes a darker green colour, in (2) the dark colour develops after the formation of only one leaf. These symptoms were transmitted by aphids fed on similar plants. The distinct nature of (3) has not yet been satisfactorily indicated. Most infections are compound, and occasionally a plant is seen with one branch of one type, and the remainder of the other. The relative numbers of plants with simple infections of types (1) and (2) vary, apparently being about equal during the rainy season, while (2) predominates during the dries.

Half an hour or less is required for one aphid to infect a healthy plant, and apparently it is possible for the insect to become clear of infection. Two wingless aphids were used, singly, each being transferred to a different healthy plant daily; one died after being on seven, the other on ten, plants; but in each case no symptoms of mosaic developed after the fourth plant.

A fruit-spot of BANANA is caused by the feeding of aphids while the fruit is young, the damage being done mainly as soon as the inflorescence bracts are open sufficiently to allow the insects to enter. Most of the spotting appears towards either the base or tip of the fingers, and fruit bunches on the sunny side of a plant are more seriously affected than others. The aphids live around the leaf bases, and similar spotting is also evident on the stalk of the inflorescence, the inner surface of the mid-rib and sometimes on the lamina. They are attended by ants, and it is apparently due to the attentions of these, which prefer the sunny side, that damage is more marked on that side.

Before the appearance of the flower-stalk, the aphids are easily reached by a wash; when the inflorescence has appeared, it is impossible to reach them all, and as most of them advance with the opening of the bracts, control is likely to be concerned largely with the collection and disposal of the terminal part of the inflorescence after setting of fruit is completed.

The development of the spot from the young to the ripe fruit has not yet been traced in detail, and work is in progress. In the meantime a block of banana plants is being periodically sprayed to keep the aphis in check; and later, comparison of fruit from treated and untreated plants will be possible. Thrips is also common on the flowers, but damage to fruit is negligible. The aphid also occurs on the wild "seed banana."

A moth which proved to be *Argyroploce leucotreta*, Meyr., attacks the fruit of AVOCADO; the larvæ live in the pulp beneath the skin, and indicate their presence by the production of black raised spots; they pupate *in situ*, and on emergence, when the fruit is ripe, the empty pupa case remains projecting from the skin. In some cases, a large proportion of fruit is affected, and as many as six larva have been found in one fruit.

Early in the year, twenty-three reports of swarms of LOCUSTS were received, many during February; no eggs are deposited by these. One horde of hoppers was reported to have crossed the border from French Guinea on the north during May. No further locusts were reported until the end of December, when there were apparently two swarms in the country, the first entering from French Guinea on the west. Damage has been practically negligible. Only *Locusta migratoria* was concerned. Two species of parasites of locust adults were identified as *Sarcophaga furcadorsalis*, Rohd. sp. n., and *Blasoripha filipjevi æquatorialis*, Rohd.

Early in the year, many adults of *Zonocerus variegatus*, L., were found to be parasitized by flies; and during May and June, out-of-season hoppers which were far more numerous than usual were similarly affected. It is noteworthy that Dipterous parasites had not previously been found, and it appears likely that their occurrence is connected with the locust invasion.

The REFERENCE COLLECTION was greatly extended; and the 2,400 specimens sent for identification to the Imperial Institute of Entomology included twenty-five new species and fifteen new to the British Museum.

E. HARGREAVES,
Entomologist.

MYCOLOGICAL WORK.

The following account of the work is given first under the different crops and plants with which it was done.

Black tip-rot of Cavendish BANANA, associated with *Helminthosporium torulosum*, was common at Njala towards the end of the year. A "cigar-end" rot was also found on the same variety, associated with a *Fusicillium* which was apparently following *Helminthosporium torulosum*. Leaf-blotch was associated with *Helminthosporium torulosum* and *Sclerotium musæ*, the former being the common fungus at the margin.

An observation plot containing 501 healthy plants of 14 different varieties of CASSAVA was planted at Njala in May with 39 mosaiced plants distributed regularly through the plot. Symptoms of mosaic were first noticed on some of the originally healthy plants at the end of August, and the disease continued to spread till mid-November, by which time 17 of the originally healthy plants had become infected. No further spread of the disease was observed after the middle of November. The plants which became infected belonged to 7 different varieties. Of the cassava plants which remained healthy, 94 belonged to 2 varieties believed to be very resistant to the disease, namely the mayugbe and two-cent that are being actively spread throughout the country by the department.

The leaf-fall and die-back of cassava recorded in the last report has been seen to be a normal response of full-grown plants to dry season conditions. It is particularly marked on some varieties.

Observations have been continued on the incidence of scab on the leaves of the young CITRUS trees at Njala. As recorded in the last report, scab lesions can be found on the occasional leaves produced in the height of the dry season. Yet on the main flush of leaves which were produced in 1932 during the last days of February and the first days of March, it was difficult to find any evidence of infection. Flowers opened on these trees about ten days later and the fruit from these was for the most part quite badly scabbed. Leaf production practically ceased after this flush until the end of April, after which a few leaves and fruits were produced throughout the rainy season, all being more or less badly scabbed. An attempt is being made to correlate weather conditions with infection and particularly with the apparently regular escape of the main leaf flush from the disease, but results are inconclusive so far.

Scab has this year been seen on the leaves and fruit of some of the young Satsuma oranges at Njala, in addition to the citrus hosts previously recorded.

At Newton this year a large number of grapefruit trees which were imported in 1929 have been attacked by gummosis. 22 out of the 25 McCarty and a number of the Duncan were affected. All these trees had been budded low down; in some cases so low that the bud-union was below soil-level. Both stock and scion were affected, but unfortunately the variety of the former is unknown. Some of the imported Genoa lemon trees at Njala are also attacked and here also budding (on rough lemon) has been near soil-level. No attempt has been made to isolate the fungus responsible in these cases: from a severe case of gummosis on sweet orange at Njala in 1929 was isolated a strain of *Phytophthora parasitica*.

As gummosis must be considered a disease likely to be very troublesome in Sierra Leone, stress is laid upon the connexion between low budding and infection. Resistant stocks should be used if these are otherwise suitable, and planting on small mounds so that the rain-wash will eventually expose the crown roots should also prove beneficial.

Rotting of citrus fruits in the field seems normally to follow punctures by needle or by fruit-piercing moths. The several different fungi which can cause this rotting are being investigated. Those most commonly encountered have been strains of *Fusarium* and two yeasts. *Fusarium* was most common in October–November, but at the end of the year the yeasts were the fungi most constantly observed and were the only ones found associated with the rot of sweet limes which quickly and regularly followed every moth puncture. Other fungi occasionally isolated were *Oospora citri-aurantii*, *Glæosporium*, *Phomopsis* and *Diplodia*. Often only one kind of fungus was found in a fruit, but *Fusarium* was sometimes associated with yeasts and bacteria.

In the laboratory *Aspergillus niger* was a constant trouble and caused rapid rotting of all kinds of citrus fruits. It is not likely to be troublesome in storage and packing sheds provided that these are suitably constructed.

A leaf disease of OIL-PALMS of the Deli type was seen early in the year at Njala but the causal organism is unknown. The attack apparently begins on the young unexpanded spear-leaves. On recently expanded leaves the mid-ribs and pinnae, chiefly in the middle of the leaf, were incompletely expanded, the pinnae being stuck together at their distal points, and were covered with a *Fusarium* which was considered secondary. A *Phyllosticta* was present on the older leaves. The disease was noticed to be again present on a few Deli palms at the end of the year. Deli at Masanki also showed signs of fungal attack in May: in this case a rotting of the young leaf occurred. No other variety of oil-palm has been seen with any similar disease.

A blossom-drop of AVOCADO, associated with *Botrytis*, was common at Njala in November and December and is likely to prove serious should plantations be established. On one group of young trees there it was impossible to find an inflorescence free from attack, and although they were full of flower-buds very few fruits formed. Flowers about to open became covered with the grey sporophores of the *Botrytis* and fell off, and even whole inflorescences dropped. What appears to be the same *Botrytis* was found on flowers of *Jatropha podagrica* in gardens near by.

A leaf-blotch, zoned dark and paler brown above and a uniform pale brown below, is also common on avocado at Njala. Lesions occur chiefly at the edge of the leaves and up to about a-quarter of the leaf may be affected. A *Colletotrichum* with sparse setae was found in association with the disease in November.

MISCELLANEOUS DISEASES recorded include a leaf-spot of a cultivated Begonia and a collar rot of large *Bauhinia tomentosa* plants, both caused by *Sclerotium rolfsii*; leaf-blotch of red-leaved ornamental *Dracæna* caused by *Fusarium* sp.; brown eye-spot of Canephora and Stenophylla coffee berries, caused by *Cercospora coffeicola*; leaf-spot of young *Wallichia disticha*, possibly caused by a *Phyllosticta*; *Plasmopara viticola*, on leaves of grapevine.

The following identifications have been received from the Imperial Mycological Institute: *Parodiella perisporioides* (B. & C.) Speg., on *Crotalaria retusa*; *Cercospora cucurbitæ* Ell. & Ev., on *Luffa cylindrica* and *Lagenaria vulgaris*; *Cercospora* sp., on *Boerhaavia diffusa*; *Phyllosticta batatæ* Thum., on sweet potato; *Aecidium tubulosum* Pat. & Guill. ("African form"), on egg-plant (*Solanum ^{albidosum} incanum*); *Alternaria macrospora* Zimm., on pods of French bean (*Phaseolus*); *Trametes Meyenii* Kl., on *Cynometra* (?) *leonensis*. The following entomogenous fungi: *Empusa fresenii* Nowak, common in January on *Aphis laburni* on ground-nuts; *Aschersonia marginata* Ell. & Ev. (*Hypocrella Reineckiana* P. Henn.), on *Pulvinaria* sp. on guava and monkey apple (*Anisophyllea laurina*); The following sooty moulds: *Meliola cookeana* Speg. on *Avicennia nitida*; *M. bicornis* Wint., on *Gliricidia maculata* and *Erythrina* sp.; *M. diospyri* Syd., on *Diospyros Heudelotti*; *M. paulliniæ* Stevens, on *Paullinia pinnata*; *M. sp.*, near *capensis* (K. & Cke.) Theiss., on *Phialodiscus unijugatus*; *M. sp.*, probably *acaciarum* Speg., on *Pterocarpus santalinoides*; *M. sp.*, on *Amaralia Sherbourniæ*. The following saprophytes: *Hexagonia Miquelii* (Mont.) Sacc.; *Lentinus tuber-regium* Fr.; *Helminthosporium gigasporum* B. & Br. subsp. *javanicum* Penz. & Sacc.; *Stilbum nanum* Mass.; *Monilia sitophilæ* (Mont.) Sacc.; *Trichoderma Koningi* Oudem.; *Periconia* sp.

Over 400 species, including collections by Mr. R. R. Glanville and Mr. J. W. D. Fisher, were added to the HERBARIUM during the year. Duplicates of these have been sent to Kew.

F. C. DEIGHTON,
Mycologist.

NJALA AGRICULTURAL STATION.

For the first three months of the year Mr. G. M. Roddan, Agricultural Officer, was in charge of the station and for the remainder Mr. E. I. Nisbett.

With reference to PERENNIAL CROPS, in the CITRUS plantation the late Valencia and Washington Navel oranges obtained from South Africa and planted in 1926 have again borne a good crop. The Late Valencia fruit has shown great improvement; juice-content and flavour are now very satisfactory. The Washington

Navel is still of poor quality though there are signs of improvement. The Satsuma and St. Michael oranges obtained from England and planted in 1928 have just come into bearing and have produced a few fruits of fair quality.

The Genoa lemons obtained from Florida and planted in 1927 have again borne well, and the Villa Franca lemons planted in 1928 have come into bearing. The juice-content and flavour of both are good.

Of the grapefruit obtained from Florida and planted in 1927 and 1928, the Foster has borne a good crop of fruit of excellent juice-content and flavour. Some of the Marsh trees have also carried a fair crop of excellent fruit but many trees have produced a few fruits and most of them have not yet come into bearing. The Thompson and McCarty obtained from the same source and planted in 1929 have not yet come into bearing.

The grapefruit trees in the Arboretum, obtained from Florida in 1916, have borne satisfactory crops of excellent fruit; but for the past two years their fruiting season has been irregular.

The Pigeon Pea sown between the trees in May, 1931, to provide mulch material has been cut twice during the year. Tephrosia was again put in at the beginning of the rains, having failed last year, and germinated well; it is coming on but making slow growth.

The yield of Dominica Limes shows a slight increase on the previous year's. The planting distance trial indicates clearly the advantage of the wide spacing. The sections from which the alternate trees were cut out in 1927 yield just about double that from the sections on which the trees are at the original planting distance 15 by 15 feet. The ratio of yield has progressed in favour of the thinned sections. No manures have been applied since 1929 but their influence is still apparent. Plot 1 received Nitrogen, Potash and Phosphate; Plot 2 Nitrogen and Potash; and Plot 3 was the control. The following table gives the yield in bushels per 100 trees during the past five years: A, thinned section; B, unthinned section:—

	Plot 1		Plot 2		Plot 3	
	A	B	A	B	A	B
1928	633	763	370	474	455	431
1929	681	512	465	327	389	247
1930	532	392	492	259	257	186
1931	348	153	205	72	159	52
1932	376	485	330	166	132	97

The existing Canephora, Robusta and Stenophylla COFFEE plantations have been maintained only for the supply of seed, the whole of which has been distributed through the Circle Officers.

Excelsa coffee plants raised from seed received from Porto Rico during the year are doing well and will be planted out next season.

The trial begun last year in the KOLA plantation to find the effect on yield of "spiralling" and root-pruning the trees has shown that "spiralling" causes a substantial increase but root-pruning appears to have little effect. Observations taken during November showed that the crop on the "spiralled" trees, though much less than that of last year, was three times as great as the average for the five years prior to treatment.

The SISAL is maintained only as an economical source of cordage. Planted in 1924 its first leaves were cut in 1927, but the plot has never been cropped to capacity. Most of the plants are now poling, this having begun in 1931. A nursery of bulbils has been laid down for extending the plantation.

The HYDNOCARPUS trees (*H. anthelmintica* and six specimens of *H. wightiana*) raised from seed received in 1927 and planted out in 1928 in lanes cut in standing bush are making progress, but have shown signs of over-shading and the bush round them has therefore been thinned out.

Further additions have been made to the collection in the ARBORETUM; among others, specimen groups of *Brunfelsia americana*, *Parmentiera cerifera*, *Cassia auriculata*, and *Cassia didymobotria* have been planted out. Other interesting trees are being raised in the nursery, some of which will be planted out in 1933.

With reference to ANNUAL CROPS, the trial with native varieties of WET-LAND RICES begun in 1930 were continued. Seed raised from the Ceylon and Indian kinds grown in 1931 was sent to the main wet-land rice grown areas of the country for more extensive trial under the conditions of those areas.

Notes on the native rices are given as follows:—

Variety.	Duration in days.	Average number of tillers.	Height.	Colour of grain.	Remarks.
Indo-China ...	240	3.2	4½	Red	Badly lodged through insufficient depth of water.
D. C. ...	194	3.2	4½	White	Lodged slightly; depth of water has little effect but shows slight preference for shallow water.
Kima ...	219	4.0	2½	Red and white	Fair stand.
Litoma ...	219	6.8	2½	Red and white	Good stand.
Yenti ...	182	4.4	3 to 4 ft.	White	Good stand in water 3 feet and over.
Bowden's Kono ...	237	4.3	2¾	Red	Good stand in 3 feet of water.
Koba ...	225	5.0	3	White	Fair stand, prefers shallow water.
Mampa ...	241	3.4	2	White	Very poor, conditions unsuitable.
Kalimodu ...	242	2.1	3½	Red and white	Poor, conditions unsuitable.
Fodea ...	237	5.5	2½	White	Fair, prefers shallow water.
Yoso ...	199	3.7	3	Red and white	Fair, even stand.
Totoko ...	186	5.1	3½	White	Fair, prefers shallow water.
Yaka ...	219	7.5	2¾	Red	Lodged in deeper water.
Kanlu ...	240	2.9	3½	Red and white	Poor, prefers shallow water.

Variety.	Duration in days.	Average number of tillers.	Height.	Colour of grain.	Remarks.
Kanlukafol	...	6.4	2½	White	Very good, prefers shallow water.
Bolo	...	3.7	3	Red	Very fair.
Lal ...	...	4.9	2¾	Red and white	Good, prefers shallow water.
Alibig	...	3.6	3	Red	Good, lodged slightly in deeper water.
Indian	...	4.4	3	Red	Fair, lodged in deeper water.
Jabati	...	3.6	3	White	Lodged slightly in deeper water; requires a longer season than it gets in this swamp.
Black Yakei	...	3.0	3	White	Fair, but poor in deeper water.
Gbongo Yaka	...	3.6	3½	Red	Poor, lodged badly, prefers shallow water.
Ali Amara	...	6.2	3	White	Very fair, satisfactory in 2 to 3 feet of water.

The swamp is not altogether suitable and a better site will be selected for further trials.

Chinese YAMS were again grown for distribution as "seed" as they are in great demand, for their cultivation is quickly spreading.

LEGUMES for use as cover crops under observation include PIGEON PEA, CALOPOGONIUM (*C. mucunoides*), BENGAL BEAN, *Pueraria thunbergiana*, *P. javanica* BONAVID BEAN (*Dolichos Lablab*) and *Tephrosia candida*. Calopogonium is very satisfactory in the Arboretum where it comes up year after year and produces a dense cover and unlike Calopogonium remains green in now naturalized about the station. *Pueraria thunbergiana* has done very well in the Deli Oil-palm plantation and other plots; it produces a dense cover and unlike Calopogonium remains green in the dry season. Bengal bean gives a dense cover and bulk for digging in as green manure but is too rampant for use in plantations. Bonavid bean has not up to the present proved successful and *Tephrosia* is a rather slow grower. *Pueraria javanica* promises well. All these, with the possible exception of Bengal Bean which has been naturalized for some time, and Pigeon Pea, have required care when first introduced before they became established.

The trials on a small scale with Cowpea, *Dolichos biflorus*, *Crotalaria juncea*, *Tephrosia purpurea* and varieties of *Phaseolus* gave satisfactory results with the Cowpea, *Dolichos* and *Crotalaria*; but the *Tephrosia* and *Phaseolus* made a poor showing, probably partly due to seed of low vitality.

Two varieties of Cowpea, known as Waterloo and Birds-eye, received from the Western Circle, were grown for comparison. Sown on October 5th, the Birds-eye proved much the quicker in maturing and was harvested during the latter half of December; the Waterloo remained green and was not harvested until a month later.

The work with SUNN HEMP (*Crotalaria juncea*) with the object of finding out its suitability as a fibre-producing crop for Sierra Leone was continued, but has been delayed somewhat owing to the small amount of seed produced by the 1931 crop and the consequent necessity for procuring further supplies from Nyasaland and Rhodesia. Having shown in 1931 that a satisfactory fibre could be produced and having indicated the preferable type of soil and site, work has had to be confined mainly to seed-production. Seed was sown on a lateritic slope as soon as received in mid-October and mid-November, and has produced well, the later sown catching up earlier in vegetative growth but maturing seed later.

RIVER PLATE MAIZE, imported through the good offices of a dealer in England, has been tried. $4\frac{1}{2}$ lb. was sown in mid-September, 3 ft. by 18 in. on sloping land. The crop was harvested in the second half of December and yielded 112 lb. A sample to the supplier has received an excellent report.

The practicability of propagating GINGER from thin slices of rhizome instead of large pieces is under investigation.

A new activity, DISTRICT WORK, begun in July, 1931, and serving five chiefdoms—Kori, Kamagai, Maje, Kowa and Dase—directly from the Station, has successfully brought neighbouring farmers and the station into closer touch; and there is every indication of increased and accelerated progress, which is described below.

During 1931 thirty new COFFEE plantations had been made, nearly all the plants being raised at Njala. As a result of the interest taken in these plantations, and because a few made in 1928 came into bearing and gave a cash return, the number of farmers applying for and receiving instruction in the making of nurseries to be sown with seed from the crop maturing at the close of 1932 will be over 100. There has also been a marked improvement in the care of plantations on account of both increased knowledge and interest.

Assistance has been given for two oil-palm plantations for farmers, and at the request of the administration for one communal in each of the ten sections of Kori Chiefdom. Although the latter will probably fail through neglect, they have caused so much interest that a number of applications has been received for assistance in making more plantations next season, and there is prospect of a quickening demand.

Fifty-seven bushels of WET-LAND RICE seed of good varieties—D.C. and Litoma—were distributed to farmers with the assistance of the chiefs, and intensive instruction given in nursery and transplanting work. The crop has been taken up readily and there seems no doubt that wet-land rice growing will become part of the normal farming activities in the district. The importance of rice grown in this way is not only that it enables otherwise unproductive land to be utilized, but it lessens the demand of upland farm-land which causes increasingly frequent felling of bush; it also ensures a supply of the staple food in years when early rains interfere with upland farm clearing.

UPLAND RICE farming was hampered by early rains and some areas of felled bush were unable to be cleared for planting except with greatly increased labour. This object-lesson, however, aided the introduction of wet-land rice.

Owing to low price the quantity of GINGER harvested was not great.

A survey has been made of PIASSAVA stands followed by demonstrations and instruction in preparation of the fibre and the laying down of retting grounds, including one at Njala. Production from this new industry for the district has definitely started, and the quality is most encouraging.

E. INNES NISBETT,
Agricultural Officer.

NJALA OIL-PALM PLOTS.

Cultural operations were confined as before to cutlassing the grass and removing old leaves to heaps between the rows. Ring-weeding was continued.

The NIGERIAN PALMS are in their twelfth year after planting. No new trees came into bearing in 1932, and the kinds and numbers are therefore the same as given in the last report; there are still ten trees which have not yet fruited.

Five trees of the A (thin-shelled) and one of the B (thick-shelled) group did not bear fruit in 1932, namely A 2/12, 7/11, 9/13, 21/2 and 25/7; and B. 23/9 (*italics indicating non-bearers in either 1929, 1930, 1931 or 1932*). In addition, 21/2 did not bear in 1929, 1931 or 1932. Tree 7/11 only commenced to bear in November, 1931. The B 23/9 has given an average yield for the years previous to 1932 but seems to alternate a rather large yield one year with a small one the next.

Beginning with 1932, all weights will be recorded in kilograms instead of pounds, for better convenience.

The figures for the YIELD of the different groups, the yield of the whole plantation, and of averages, etc., are given in Appendix IV, A-G. The production for the first three months of the year was greater than for the corresponding months of 1931, but the yield in the second quarter was less, and the total output of fruit for 1932 was roughly 1,200 lb. less than for 1931. It was nevertheless greater than for any one of the years prior to 1931. The number of fruit-bearing heads was thirty-two more than in 1931, but there was a decrease of nineteen in the number of "blind" (abortive) heads harvested.

As in previous years, the proportion of fruit per head for the thin-shelled was, as a rule, considerably less than for the thick-shelled, though in June and August this year it was slightly greater.

In regard to FLOWERING, the number of female inflorescences at anthesis recorded during the year was 547 less than in 1931. There were again two waves of flowering with crests about April and September. These may correspond with the two chief seasons

of growth of the year: the beginning of the rains and the end of the heavy part of the rainy season, although this does not completely explain the fact that the September wave of flowering begins in August and continues to October. The many species of the wild vegetation at Njala which come into flower about this time do so rather suddenly about the end of September and beginning of October.

There was a decrease of 595 in the number of male inflorescences flowering during 1932 compared with 1931. From 1928 to 1931 the numbers had increased regularly by about 1,000 each year. As in 1930 and 1931 the number of male inflorescences flowering this year was more than twice the number of females. May this year was the one month when there were fewer male than female inflorescences in flower, corresponding with June in previous years. The month of minimum production of male flowers was June, and that of maximum November. Again, there was only one wave of flowering of male inflorescences during the year.

The AVERAGE WEIGHT OF FRUIT PER HEAD for thick-shelled was 1 kg. more than for thin-shelled, the actual figures being 4.8 and 3.8 kg., respectively: the average weight of head was 7.6 and 6.5 kg., respectively. The average output of fruit of B palms was, as in 1930 and 1931, about one-and-a-half times that of A.

As in previous years, there was a larger proportion of high-yielding trees in the thick-shelled than in the thin-shelled group, although the highest yielding A palm gave 70 kg. of fruit as against 64 kg. for the highest yielding B. Eleven B palms gave over 45 kg. of fruit as against only the one A palm noted above. As regards total yield of fruit for individual palms for the seven years 1926-1932, the highest yielding A palm has given 250 kg. of fruit (2 A palms have borne over 200 kg. of fruit), while the highest yielding B palm has given 297 kg. (21 B palms have borne over 200 kg. of fruit).

The figures for the yield of the NATIVE OIL-PALMS and ANGOLA PALMS is given in Appendix IV, H-L. The plots are small for more than general conclusions to be made from figures of averages; but it will be seen that except for the Angola palms the average output of fruit per tree is very small compared with that from Nigerian palms which averaged about 10 kg. of fruit in their sixth, 17 kg. in their seventh and 19 kg. in their eighth year. Individual tree yields were small for the native palm plots, the approximate figures for the highest yielding palms of the three types being, in 1932: Ilenoi, 15 kg. (several gave 10-12 kg.); Kpolei, 30 kg. (several gave 20-25 kg.); Kawei, 30-35 kg. (several gave 20-25 kg.). Compared with this, the six Angola palms gave very good yields, although one to two years younger, two palms (one thick—and one thin shelled) each giving just

over 40 kg. of fruit, one 36 kg., two 27-28 kg. and the lowest 18 kg. The Angola palm yields are considerably better than those of the Nigerian of similar age and compare favourably with the best Nigerian palms in their eighth year.

Figures for AVERAGE WEIGHT OF HEAD and AVERAGE WEIGHT OF FRUIT PER HEAD are given in Appendix IV M. They are of a certain interest in that the order of the figures is the same as that of average yield of fruit per palm for the whole year for the different plots. The figures also show the same increase in average weight of heads towards the end of the year that has always been shown by the Nigerian palms.

That the PERIODICITY in flowering and fruiting of these palms is also similar to that of the Nigerian palms is seen in the other tables. There is the same one wave of male flowering per year; the wave of female flowering in the spring months is not very evident. Only in the Kawai plot were there more male than female inflorescences flowering during the year.

A few of the DELI OIL-PALMS set fruit this year but it will not be ready for harvest till 1933. By the end of December, about three-quarters of the palms had borne either male or female inflorescences or both. The majority bore male inflorescences only, but a very few palms bore only female inflorescences.

F. C. DEIGHTON,
Mycologist.

NEWTON EXPERIMENTAL FRUIT FARM.

The reporting officer has been in charge throughout the year.

The WATER SUPPLY was found inadequate towards the end of the dry season for normal irrigation requirements. As the rainfall for the first four months of the year was over $9\frac{1}{2}$ inches (in contrast to a previous recorded highest of a little more than 3 inches at Newton) the shortage of irrigation water was not a serious handicap.

The scheme of work for CITRUS has been revised so as to include 3 orange, 3 lemon, 1 tangerine, 1 mandarine and 1 satsuma variety within the scope of the experiments. For the sake of economy budwood, rather than plants, of these varieties was ordered. By the end of the year some of the buds, obtained from California, had been successfully propagated on nursery seedling stocks. One hundred and sixteen of the older plants, surplus to the requirements of the scheme of work, have been sold during the year. Seven hundred and eighty seedlings of Dominica lime were set out as "guard trees" in the citrus fertilizer experiment plots and were successfully established during the rainy season. Most of the McCarty grapefruit trees, received from

Florida in July, 1929, have borne fruit. A record has been kept of the vegetative and fruiting characteristics of each individual tree. None of the Duncan grapefruit plants, received from Florida in July, 1930, have as yet fruited.

Seedlings of Dominica lime and *Stenophylla* coffee have been grown for FREE DISTRIBUTION in the Colony, and 1,600 of the former have been sent out in accordance with this plan.

The first of the CANARY BANANAS in the new experiment were harvested on June 6. During the first four months of the year four irrigations were given to the blocks allocated for this treatment. The manured blocks were given applications of a "complete" inorganic manure during February and again, after the rains, in November. The following table shows the results of the differential treatments, as reflected by the yield, from June 6 to the end of the year:—

Treatment.	Plot.	Yield, lb.
Unirrigated, manured	1	2,225
	1A	2,082
Irrigated, manured	2	3,592
	2A	3,353
Unirrigated, no manure	3	349
	3A	170
Irrigated, no manure	4	307
	4A	878

The benefits of manuring are already very obvious, especially when this is done in conjunction with irrigation.

4,329 BANANA SUCKERS (at 1*d.* each), and 193,743 FRUITS (at 11 for 1*d.*) have been sold during the year.

Four trial SHIPMENTS OF BANANAS have been made to an importing Firm in London, for whose co-operation the department is indebted; and from them a corresponding number of very informative reports have been received. The reports have all been to the same effect, the main points being as follows:—

- (1) The packing is perfectly satisfactory.
- (2) When it arrives in good condition, the eating quality of the fruit is excellent.
- (3) The fingers are of good size.
- (4) The bunches (which have averaged 116 fingers) are much too small for trade requirements.

- (5) The fruit does not usually arrive in good condition. The reasons for this are not very clear as many causes may contribute. Those stressed by the Firm are the temperature during transit, and disease, which probably originates before shipment.

Native seedling AVOCADOS have made good progress, but have not as yet come into bearing. Great difficulty has been experienced in establishing imported varieties, due sometimes to their arrival in poor condition and sometimes to their lack of resistance to apparently unfavourable conditions. At the end of the year one or more plants of the Fuerte, Panchoy and Linda varieties still survived and had made some growth. It is hoped that it will soon be possible to bud from these on to seedlings which have been reserved for this purpose.

The three varieties of PINEAPPLES, namely Queen from the Gold Coast, Smooth Cayenne from French Guinea and Red Spanish (similar to the "native" variety), all bore fruit and were then employed for vegetative propagation. In addition to using the suckers, etc., the Jamaica method of utilizing dormant buds by stripping the main stem and planting discs cut from it, has been very successfully employed. Some planting material has been distributed, but even so the new method enabled the number of plants to be increased tenfold by the end of the year.

Crops have been affected by INSECT PESTS as follows:—Coffee, crickets; pineapples, mealybugs and termites (on the roots); Avocados, beetles of the genera *Trochalus* and *Lagri*, various species of scale, termites; citrus, all the above, also the beetle *Cercyonia citri* and the caterpillar *Papilio demodocus*. Efforts at control have been partially effective in the case of some of these.

The following DISEASES have been conspicuous: On coffee, undetermined, causing blackening of the leaves and stems and the death of the plant: spraying with Bordeaux mixture has not been effective. On citrus, scab: spraying with lime-sulphur solution has not given complete control; various superficial skin diseases on grapefruit, and undetermined disease of the trunk, causing gummosis in the region of the bud union on older trees: the last has been very successfully overcome by surgery, followed by disinfection of the wound and the use of young seedling stocks of sour orange to bridge over the affected areas.

Maintenance of buildings, etc., has been attended to as necessary.

E. S. GARNER,
Agricultural Officer.

MASANKI OIL-PALM PLANTATION.

During the first five months the Plantation was managed by Mr. M. Vardy, who had been superseded at Newton Fruit Farm. Mr. W. F. Williams resumed duty as officer-in-charge from June 1st to October 22nd, after which he went on leave on termination of contract under the new scheme (*see below*), Mr. G. M. Roddan assisting with the final work of disposal and stocktaking preparatory to entering upon this, and Mr. P. J. Moss being available at Mabang for any work of direction required subsequently.

In the first six months field work was chiefly brushing, mulching and ring-weeding, and weeding of lalang (including hand-pulling, found economically effective in the long run, where suitable). 27 cwt. of *Calopogonium mucunoides* was harvested, and sown as a smother crop for lalang as far as the quantity allowed. With the report for this period was communicated a summary of the history of the palms in the Plantation, and their planting, for which the officer-in-charge gave valuable aid.

In the latter six months the nurseries were maintained, the popular distribution to farmers of Nigerian palms not likely to be required being continued. Field work consisted chiefly of the seasonal brushing, a sum of £150 in addition to the normal being expended in September to October in order to leave the Plantation as clean as possible for the new maintenance scheme. The chief work of these months was supplying and planting out: and by the end of them the whole of the planting of the area was completed. The chief menace to the Plantation is rats. In the last plantings it was sought to minimize damage as much as possible by using for supplying and completing planting seedlings from eighteen months to two years old.

In October the Plantation was placed under a maintenance scheme employing temporary labour, which has been approved by the Secretary of State. In this the Plantation is maintained with the aid of the local Native Authority, under supervision by the Agricultural Department, for the consideration of payment in respect of labour and of freedom to collect the palm produce, unless or until it is disposed of by Government. Other services provided are overseer, caretaker, cutlasses and rent, the total cost for these with the temporary labour being estimated at £310 for 1933.

The only field work under the new scheme was cutting fire traces along the railway in December where necessary for protection. The chief danger from fire comes from the railway, and the General Manager is co-operating in all possible ways to minimize this.

Appendix I.

DISTRIBUTION OF PLANTING MATERIAL 1932.

	Northern Circle.	North-western Circle	Western Circle.	Eastern Circle.	Njala Agricultural Station.	Newton Farm.
Almond, Wild ...	—	—	—	—	54	—
Avocado ...	—	—	—	—	25	—
Banana, Canary (suckers)	4	636	—	—	—	4,329
Breadfruit ...	12	12	—	—	30	—
Breadnut ..	—	—	—	—	40	—
Cacao, pods ...	459	—	—	—	—	—
Cacao, seedlings ...	—	275	—	—	30	—
Cassava, Mayugbe. sticks, (bundles) ...	135	9	—	40	40	—
Cassava, Two-cent, sticks, (bundles) ...	—	—	45	60	—	—
Coffee, Canephora, seed, lb.	87	50	—	—	116	—
" " seedlings	287	4,000	—	—	7	—
" Liberian, seed, lb.	—	—	—	—	1	—
" " seedlings	—	—	—	—	1	—
" Robusta, seed, lb. ...	—	—	218	100	249	—
" " seedlings ...	—	—	—	2,242	1	—
" Stenophylla, seed, lb.	—	—	—	—	71	—
" " seedlings	—	—	—	—	1	—
Coconut, seedlings ...	—	60	—	—	—	—

DISTRIBUTION OF PLANTING MATERIAL 1932—*continued.*

	Northern Circle.	North-western Circle.	Western Circle.	Eastern Circle.	Njala Agricultural Station.	Newton Farm.
Cinnamon ...	—	—	—	—	44	—
Cashew ...	—	—	—	—	2	—
Ginger, lb. ...	14	—	112	619	7,508	—
Ground-nut, Kono, lb. ...	—	—	—	10	—	—
Ground-nut, other, bushel	—	—	—	—	1	—
Jakfruit ...	—	—	—	—	32	—
Kola ...	—	—	—	—	14	—
Lime, Sierra Leone, seedlings	—	—	—	—	100	—
Lime, Dominica, seedlings	—	—	—	—	—	1,600
" Sweet ...	—	—	—	—	59	—
Mango, Cherry ...	—	—	—	—	51	—
Oil-palm, Nigerian, seeds, cwt.	$\frac{1}{2}$	—	—	2	2	—
Oil-palm, Nigerian, seedlings	2,273	1,220	10,000	3,600	114	—
Potato, Sweet (vines), bundles	22	—	—	—	—	—
Pawpaw ...	—	—	—	—	22	—
Pea, Pigeon, seed, lb.	—	—	—	—	36	—
" Cow, seed, lb.	—	—	16	20	—	—
Rice, D.C., bushels	47	—	135	—	—	—
" Látoma, bushels	—	—	135	—	—	—

DISTRIBUTION OF PLANTING MATERIAL, 1932—*continued*.

— — — —	Northern Circle.	North-western Circle.	Western Circle.	Eastern Circle.	Njala Agricultural Station.	Newton Farm.
Rice (unspecified) lb.	—	—	—	—	20	—
" Upland, bushels	—	—	—	2	—	—
" Wet-land, bushels	—	—	—	8	—	—
Rose-apple	—	—	—	—	133	—
Soursop	—	—	—	—	12	—
Sweetsop	—	—	—	—	24	—
Sunn Hemp, seed, lb.	—	—	—	—	4	—
Tangerine	—	—	—	—	36	—
Yams, Chinese, lb.	1,071	120	250	625	2,126	—
" Yellow, lb.	1,586	45	—	190	128	—
" Nigerian	67	—	20	—	—	—

Appendix II.

RAINFALL, 1932.

	NORTHERN CIRCLE.			WESTERN CIRCLE.					EASTERN CIRCLE.				COLONY.		
	Batkmun.	Kabala.	Makump.	Bonthe.	Mamanki.	Moyamba.	Koyelma.	Njala.	Bununbu.	Jalama.	Kailahun.	Segbwema.	Hill Station.	Kissy.	Newton.
January	0.56	—	0.02	0.12	—	—	0.51	0.60	0.40	—	1.65	0.18	0.63	0.22	—
February	0.67	1.16	2.48	4.08	0.34	1.99	1.82	2.47	2.92	2.17	2.07	3.71	3.42	3.68	1.06
March	2.88	4.88	8.09	3.08	4.37	6.73	10.28	7.44	6.46	5.26	5.43	11.32	2.63	2.47	4.48
April	6.97	7.25	10.62	8.06	2.41	5.14	13.13	8.60	10.31	6.56	9.44	9.23	8.89	12.87	4.03
May	17.37	6.47	11.00	21.27	8.60	8.17	10.95	10.24	9.74	11.10	10.16	17.06	7.62	6.84	5.78
June	20.15	16.15	18.11	13.82	9.16	10.14	14.13	15.56	—	11.41	23.64	11.50	28.67	18.64	9.73
July	12.98	15.17	13.34	24.00	24.21	8.74	14.72	8.81	8.78	10.53	15.84	10.16	39.59	24.15	36.76
August	14.58	17.01	23.16	14.32	11.53	12.57	20.74	14.06	—	9.15	29.04	14.31	22.32	11.61	10.49
September	16.15	11.91	16.05	29.03	19.49	16.39	25.03	23.50	21.83	12.06	22.98	17.68	25.08	23.84	22.62
October	17.16	14.01	20.50	26.89	—	9.32	15.26	10.29	15.23	9.94	15.10	10.75	7.08	9.85	16.40
November	8.18	9.51	8.28	12.44	—	9.88	10.26	8.04	7.34	8.53	7.26	6.32	6.69	8.86	7.38
December	0.38	—	0.22	2.08	—	—	0.76	0.43	0.86	1.66	1.44	1.13	0.99	2.58	0.88
Total	118.03	—	134.87	159.19	—	—	137.59	110.04	—	—	144.35	113.35	153.61	125.61	—

Appendix III.

REVENUE.

	£	s.	d.	£	s.	d.
LICENCES :						
Produce 	1,184	0	0			
Fines for contravention of						
Produce Ordinance ...	180	0	0			
Verification of weights and						
measures 	14	14	7			
Departmental fines ...	1	5	7			
				1,380	0	2
FEEs OF COURT OR OFFICE, ETC.:						
	£	s.	d.			
Sale of Government stores ...	16	14	4			
Sale of produce 	118	4	10			
Sales, Fruit Farm, Newton	86	4	10			
Sales, Oil-palm Plantation						
Masanki 	25	0	0			
				246	4	0
Total 						
				£1,626	4	2

	YIELD OF A.				YIELD OF B.				YIELD OF C.				YIELD OF D.			
	...	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads, kg.	Weight of fruit, kg.	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads, kg.	Weight of fruit, kg.	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads, kg.	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads, kg.	Weight of fruit, kg.
January ...	...	31	41	285.3	152.3	34	51	371.4	230.5	3	3	17.1	—	—	—	—
February	...	46	59	323.5	160.4	55	75	555.9	365.3	3	4	19.6	—	—	—	—
March ...	...	78	170	967.6	557.4	87	179	1,195.2	761.0	6	13	67.7	—	—	—	—
April ...	...	59	123	768.3	444.5	52	99	668.5	433.4	4	5	27.5	1	1	5.0	3.0
May ...	...	30	46	295.3	171.4	37	71	458.0	264.5	4	6	46.0	1	1	3.5	2.0
June ...	...	24	34	236.3	142.8	28	51	267.3	155.4	3	5	32.7	—	—	—	—
July ...	...	21	25	148.0	88.0	33	47	352.7	216.8	2	3	15.5	—	—	—	—
August ...	...	27	29	186.3	117.6	41	56	476.6	294.4	1	1	8.5	—	—	—	—
September	...	50	63	412.9	263.8	44	60	594.4	388.2	3	3	25.4	—	—	—	—
October ...	...	46	59	427.3	251.6	34	50	437.1	288.2	9	10	87.2	1	2	20.8	15.0
November	...	43	58	486.3	296.7	21	27	291.7	195.1	8	9	97.9	—	—	—	—
December	...	26	30	218.3	124.6	24	29	305.8	204.0	2	4	25.1	—	—	—	—
Total	...	144	737	4,755.4	2,771.1	158	795	5,974.6	3,796.8	15	66	470.2	1	4	29.3	20.0

Appendix IVB.
NIGERIAN OIL-PALMS, NJALA, 1932.

YIELD OF WHOLE PLANTATION.

		Number of trees from which heads were harvested.	Number of heads harvested.			Weight of good heads harvested, kg.	Weight of fruit, kg.
January	...	68	95	+	7 blind	102	393
February	...	104	138	+	1	139	537
March	...	171	362	+	19	381	1,357
April	...	116	228	+	13	241	896
May	...	72	124	+	10	134	465
June	...	55	90	+	20	110	318
July	...	56	75	+	11	86	315
August	...	69	86	+	14	100	416
September	...	97	126	+	7	133	670
October	...	90	121	+	2	123	611
November	...	72	94	+	5	99	559
December	...	52	63	+	23	86	343
Total	...	318	1,602	+	132 blind	1,734	6,880

Appendix IVc.

NIGERIAN OIL-PALMS, N.JALA, 1932.

COMPARATIVE YIELD OF TREES IN THE PLANTATION.

Yield in Kg. of fruit.	Actual plot figures.															Total number of trees in the plot bearing in 1932.
	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65	65-70	70-75	
A	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	144
B	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	158
C	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	15
D	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Total (Whole Plot)																
A	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	318
B	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Percentage of total number of bearing trees in the plot.																
A	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.7
B	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Whole Plantation																
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.3

Appendix IV_D.

NIGERIAN OIL-PALMS, NJALA, 1932.

COMPARISON OF TOTAL YIELD OF FRUIT OF INDIVIDUAL TREES IN THE PLANTATION FOR THE SEVEN YEARS, 1926-1932.

Yield in Kg. of Fruit.	Total number of trees in the plot bearing.														
	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200	200-220	220-240	240-260	260-280	280-300
A ...	7	7	12	17	18	34	21	22	7	2	1	—	1	—	—
B ...	7	1	1	14	11	16	36	20	19	13	6	7	6	—	2
C ...	—	1	—	2	3	3	2	3	—	1	—	—	—	—	—
D ...	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—
Total	14	9	13	33	32	53	59	45	27	16	7	7	7	—	2
324															

Ten trees have not yet borne fruits.

Appendix IV.

NIGERIAN OIL-PALMS, NJALA, 1932.

—				Average weight, heads, Kg.	Average weight, fruit per head, Kg.	Percentage fruit in head.
January—	A	...	...	7.0	3.7	53
	B	...	...	7.3	4.5	62
	Whole plot	...	...	7.1	4.1	58
February—	A	...	...	5.5	2.7	50
	B	...	...	7.4	4.9	66
	Whole plot	...	...	6.5	3.9	60
March—	A	...	...	5.7	3.3	58
	B	...	...	6.7	4.3	64
	Whole plot	...	...	6.2	3.7	61
April—	A	...	...	6.2	3.6	58
	B	...	...	6.8	4.4	65
	Whole plot	...	...	6.4	3.9	61
May—	A	...	...	6.4	3.7	58
	B	...	...	6.5	3.7	58
	Whole plot	...	...	6.5	3.8	58
June—	A	...	...	6.9	4.2	60
	B	...	...	5.2	3.0	58
	Whole plot	...	...	6.0	3.5	59
July—	A	...	...	5.9	3.5	59
	B	...	...	7.5	4.6	61
	Whole plot	...	...	6.9	4.2	61
August—	A	...	...	6.4	4.1	63
	B	...	...	8.5	5.3	62
	Whole plot	...	...	7.8	4.8	62
September—	A	...	...	6.6	4.2	64
	B	...	...	9.9	6.5	65
	Whole plot	...	...	8.2	5.3	65
October—	A	...	...	7.2	4.3	59
	B	...	...	8.7	5.8	63
	Whole plot	...	...	8.0	5.1	63
November—	A	...	...	8.4	5.1	61
	B	...	...	10.8	7.2	67
	Whole plot	...	...	9.3	5.9	64
December—	A	...	...	7.3	4.1	57
	B	...	...	10.5	7.0	67
	Whole plot	...	...	8.7	5.4	63

Appendix IV^F.

NIGERIAN OIL-PALMS, NJALA, 1932.

		AVERAGE YIELD OF FRUIT PER TREE.		AVERAGE YIELD OF FRUIT PER ACRE (at 75 trees).	
		A (Number of trees fruiting, 144) kg.	B (Number of trees fruiting, 158) kg.	A kg.	B kg.
January ...	...	1.1	1.5	79	109
February ...	...	1.1	2.3	83	173
March ...	...	3.9	4.8	290	361
April ...	...	3.1	2.7	231	206
May ...	...	1.2	1.7	89	125
June ...	...	1.0	1.0	74	74
July ...	...	0.6	1.4	46	103
August ...	...	0.8	1.9	61	140
September ...	...	1.8	2.5	137	184
October ...	...	1.7	1.8	131	137
November ...	...	2.1	1.2	154	93
December ...	...	0.9	1.3	65	97
Whole year ...	...	19.2	24.0	1,443	1,802

Average yield over all of fruit per fruiting tree, 21.6 kg. (Number of trees fruiting, 318.)

Average yield over all of fruit per acre (at 75 trees) 1,623 kg.

Appendix IVc.

NIGERIAN OIL-PALMS, NJALA, 1932.

MALE AND FEMALE INFLORESCENCES AT ANTHESIS IN
DIFFERENT MONTHS.

		Number of male inflorescences at anthesis.	Number of female inflor- escences at anthesis.	Ratio of male to female inflorescences at anthesis.
January ...	...	367	51	7·2
February ...	...	272	58	4·7
March ...	...	280	123	2·3
April ...	...	256	181	1·4
May ...	...	101	139	0·7
June ...	...	93	89	1·0
July ...	...	164	91	1·8
August ...	...	299	160	1·8
September ...	...	431	249	1·7
October ...	...	525	188	2·8
November ...	...	629	88	7·1
December ...	...	387	23	16·8
Total for the year		3,814	1,440	2·6

Appendix IVH.

KAWEI OIL-PALMS, 1932.

(161 trees in their 8th year after planting.)

	Number of trees from which heads were harvested.	Number of heads harvested.		Weight of good heads harvested, kg.	Weight of fruit, kg.	Number of male inflorescences at anthesis	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January	34	81	+ 1 blind	178.2	108.0	67	99	0.7
February	42	108	+ 1 "	224.9	133.9	88	92	1.0
March	56	141	+ 7 "	321.7	199.4	82	129	0.6
April	71	171	+ 18 "	382.2	208.2	77	79	1.0
May	68	126	+ 16 "	348.4	196.9	58	46	1.3
June	78	156	+ 24 "	410.9	220.6	4	18	0.2
July	66	121	+ 23 "	264.9	141.6	108	53	2.0
August	51	82	+ 5 "	228.2	135.0	336	109	3.1
September	52	91	+ 10 "	261.9	161.4	272	152	1.7
October	39	73	+ 10 "	269.4	157.8	216	191	1.1
November	22	32	+ 7 "	114.7	71.3	76	266	0.3
December	9	13	+ 3 "	44.0	27.0	24	156	0.2
Total	146	1,195	+ 125 blind	3,052.4	1,761.1	1,408	1,390	1.0

Average yield of fruit per bearing tree, 121 kg.

Appendix IVj.

HENOI OIL-PALMS, 1932.

(104 trees, in their 8th year after planting.)

	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of good heads harvested, kg.	Weight of fruit, kg.	Number of male inflorescences at anthesis.	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January	21	50 + 4 blind = 54	62.7	36.3	0	21	0.0
February	31	86 + 6 = 92	115.6	61.0	9	11	0.8
March	42	92 + 24 = 116	113.8	62.1	22	11	2.0
April	55	99 + 7 = 106	151.6	77.7	17	21	0.8
May	57	146 + 40 = 186	268.0	135.1	16	46	0.3
June	23	42 + 21 = 63	72.2	37.8	3	47	0.1
July	10	19 + 6 = 25	32.5	17.4	21	53	0.4
August	8	10 + 2 = 12	18.3	10.9	64	112	0.5
September	5	11 + 8 = 19	30.8	16.2	48	187	0.2
October	12	18 + 1 = 19	53.2	29.4	15	258	0.1
November	22	40 + 2 = 42	102.6	59.6	0	165	0.0
December	18	35 + 11 = 46	79.5	46.6	5	58	0.1
Total	92	648 + 132 blind = 780	1,100.8	590.1	220	990	0.2

Average yield of fruit per bearing tree, 6.4 kg.

Appendix IVк.

KPOLEI OIL-PALMS, NJALA, 1932.

(74 trees in their 7th year after planting.)

	Number of trees from which heads were harvested.	Number of heads harvested			Weight of good heads harvested. kg.	Weight of fruit, kg.	Number of male inflorescences at anthesis.	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January	3	8	+	0 blind	21.8	15.2	16	43	0.4
February	12	31	+	0	96.7	57.0	6	18	0.3
March	24	55	+	4	146.2	81.6	9	38	0.2
April	20	45	+	4	84.0	51.4	7	18	0.4
May	34	90	+	16	223.1	117.8	4	19	0.2
June	17	26	+	1	66.1	37.1	0	8	0.0
July	21	46	+	7	112.2	61.4	6	20	0.3
August	19	23	+	0	73.0	42.1	38	64	0.5
September	17	26	+	0	92.8	51.9	116	79	1.5
October	10	16	+	0	61.0	37.2	85	64	1.3
November	14	20	+	0	90.6	56.6	54	63	0.9
December	5	6	+	0	19.8	12.3	10	41	0.2
Total	61	392	+	32 blind	1,087.3	621.6	351	475	0.7

Average yield of fruit per bearing tree, 10.2 kg.

Appendix IVL

ANGOLA OIL-PALMS, NJALA, 1932.

(6 trees in their 6th year after planting.)

	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of good heads harvested, kg.	Weight of fruit, kg.	Number of male in- florescences at anthesis.	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January	2	2 + 0 blind =	7.8	4.5	2	9	0.2
February	4	7 + 0 " =	23.4	13.5	6	5	1.2
March	4	6 + 0 " =	18.0	7.5	6	6	1.0
April	...	3 + 1 " =	10.0	6.0	8	5	1.6
May	5	15 + 0 " =	58.3	32.6	2	12	0.2
June	6	9 + 0 " =	27.3	14.2	0	11	0.0
July	5	8 + 0 " =	31.2	19.5	3	4	0.7
August	2	4 + 0 " =	14.5	9.7	5	8	0.6
September	2	2 + 0 " =	7.0	3.7	5	15	0.3
October	4	7 + 1 " =	31.0	17.9	13	4	3.2
November	5	14 + 0 " =	86.7	51.1	5	11	0.5
December	3	6 + 0 " =	23.0	11.5	6	11	0.5
Total	6	83 + 2 blind =	338.2	191.7	61	101	0.6

Average yield of fruit per bearing tree, 31.9 kg.

Appendix IV_M.

NATIVE OIL-PALMS, NJALA, 1932.

	Average weight, head, kg.				Average weight, fruit, per head, kg.			
	Kawei.	Henoi.	Kpolei.	Angola.	Kawei.	Henoi	Kpolei.	Angola.
January ...	2.2	1.3	2.7	3.9	1.3	0.7	1.9	2.2
February ...	2.1	1.3	3.1	3.3	1.2	0.7	1.8	1.9
March ...	2.3	1.2	2.6	3.0	1.4	0.6	1.5	1.2
April ...	2.2	1.5	1.9	3.3	1.2	0.8	1.1	2.0
May ...	2.8	1.8	2.5	3.9	1.6	0.9	1.3	2.2
June ...	2.5	1.7	2.5	3.0	1.3	0.9	1.4	1.6
July ...	2.2	1.7	2.4	3.9	1.2	0.9	1.3	2.4
August ...	2.8	1.8	3.2	3.6	1.6	1.1	1.8	2.4
September	2.9	2.8	3.6	3.5	1.8	1.5	2.0	1.8
October ...	3.7	3.0	3.8	4.4	2.2	1.6	2.3	2.6
November	3.6	2.6	4.5	6.2	2.2	1.5	2.8	3.6
December	3.4	2.3	3.3	3.8	2.1	1.3	2.0	1.9
Whole year	2.6	1.7	2.8	4.1	1.5	0.9	1.6	2.3

